

MARCH 12 – 13, 2008  
REGENSBURG, GERMANY

The 17<sup>th</sup> “Rheology of Building Materials”-Conference was held in Regensburg in the middle of March 2008. As the host, W. Kusterle welcomed about 100 participants from more than ten countries to the University of Applied Science. In the last years this conference has become an important meeting for the European research community, as well as the application engineers of the construction materials and building industries. In a laboratory workshop, on the 2nd day, rheometrical measurements on paste, mortar and fresh concrete were presented.

S. Schneider (Knauf KG, Iphofen and Bauhaus University, Weimar, Germany) presented his research work on the field of gypsum based plasters and filling compounds. In a first practical test, holes with several diameters on the wall were filled with several types of spackles. If the holes were over a certain diameter or the compound had a poor quality the material would flow out of the hole again before hardening. In a second step the flow behavior of this empirical test was correlated with rheological measurements. Here oscillation measurements with a standard plate-plate geometry were used, to simulate airless spraying (high frequency) or the dropping out of the holes (low frequency). S. Übachs (RWTH Aachen, Germany) showed in his presentation the influence of the particle distance on the flow properties of self compacting mortars. The influence of the amount of mortar in the workability or flow behavior of fresh concrete was the topic of J. Golaszewski (Silesian Univ. of Technology, Gliwice, Poland). Rheology results were evaluated according to the Bingham model. The mortar measurement were done with the Viskomat NT, the concrete tests with the BT2 rheometer. It was shown that rheological parameters of fresh concrete, and the direction and range of its changes with time, significantly depends on the volume of mortar in fresh concrete, water/cement (w/c) ratio, superplasticizer content and interaction of these factors. Increasing volume of mortar and w/c ratio causes a decrease in yield value  $g$  and plastic viscosity  $h$ . Yield value  $g$  of concrete mixtures increases with time. The nature of changes with time in plastic viscosity  $h$  of fresh concrete depends on the mortar volume in concrete and w/c ratio. It is also proved that results obtained with mortars may be used for predicting rheological behavior of fresh concrete, if the mortar volume is at least 550 l/m<sup>3</sup>. Designing and opti-

mizing workability of fresh self-compacting concrete may be performed based on measurements of rheological parameters of the fresh mortar. Another lecturer from Silesian Univ. of Technology was Beata Lazniewska-Piekarczyk. The effects of air-entraining and air contents in the rheology of self-compacting concrete was her lecture topic. It is known that superplasticizers are increasing the air volume in concrete, but air decreases its compressive strength. If the viscosity and the yield value of the SCC is not too high, air bubbles may leave the fresh concrete before hardening, but also weakening the stability against segregation of aggregates. Three other methods reduce the air content of SCC: Using superplasticizers with non air-entraining effects, using anti-foaming agents to eliminate air bubbles and modification of electric particles potential to help air bubbles outflow.

G. Krage, (Innovation Center Iceland, Keldnaholt, Reykjavik, Iceland) presented his research project about rheology of synthetic-fiber reinforced SCC. Casting concrete segments with fiber reinforced self compacting concrete (FRSCC) eases the production process. FRSCC can combine the benefits of SCC in the fresh state and shows an improved performance in the hardened state due to the addition of fibers. Until now, the use of structural fibers made of steel is limited due to the quite poor workability of concrete reinforced with steel fibers. The obvious advantage of plastic structural fibers in concrete is that they are flexible, and therefore do not have such a negative effect on the workability. The fibers investigated are novel polymeric synthetic macro reinforcing fibers. They are mono-filament fibers with a quadrilateral cross-section, manufactured from a synthetic polymer blend. The effects on the workability, when using synthetic structural fibers are identified and interpreted. The research results are based on mortar and concrete tests, in which the consistency was tested with a coaxial cylindrical viscometer in terms of yield value,  $\tau_0$ , and plastic viscosity,  $\mu$ . Different mix designs were evaluated by varying different mix components (e.g. w/c-ratio, silica fume content, etc.) with special respect to variable fiber contents. In the research the point of interest was not only the interaction between the fibers and varied mix compositions, but also of additional interest was the workability behavior of the fibers itself. The second contribution from Ice-

Figure 1:  
Participants of “Rheology of  
Building Materials 2008” in  
Regensburg.



land was presented by Sonja Österheld (Icelandic Innovation Center, Reykjavik, Iceland). She was reporting about thixotropy in mortars and self-compacting concrete SCC is prone to generate more pressure on formwork than conventional vibrated concrete, thus demanding more robust formwork. The project deals with use of stabilizers (ST), also known as viscosity enhancing agents (VEA), in order to reduce formwork pressure. Whereas yield value and plastic viscosity are material parameters, thixotropy is different, since the thixotropy depends strongly on the shear history of the material and the degree of dispersion. Thixotropic materials, here SCC, exhibit an internal structure buildup after placing, which should result in lower form pressure. A similar reducing effect on form pressure may be experienced by the workability loss of the concrete. Causally, workability loss and thixotropy are two different phenomena. The former stems from permanent coagulation of particles, whereas the latter is caused by weak coagulation of particles (easily broken by agitation) and structural buildup (i.e. generation of junctions) of the polymers. Due to their similarity in superficial effects, thixotropy can easily be mistaken for workability loss, and it is important to distinguish between these two. Several mortar and SCC mixes containing different types of ST were examined regarding their rheological properties using the Contec Viscometer 5 as rheology measuring devices. The change in yield value was used as a measure of the workability loss. As a general tendency could be observed, that with most STs the yield value, plastic viscosity and thixotropy

increased significantly with increasing dosage of ST. Columns, each 4m high, were casted at casting speed of 10 m/h and the formwork pressure measured. The maximum measured pressure varied depending on the stabilizer used and for some mix recipes the maximum form pressure turned out to be less than half of hydrostatic pressure, even at casting rate as high as 10 m/h. A relationship between thixotropy and pressure reduction in the form work was obtained.

O. Mazanec (Technical Univ. München, Germany) presented a lecture about optimizing the mixing time for Ultra High Performance Concrete (UHCP). UHCP is a concrete with compressive strength up to 200 N/mm<sup>2</sup>, good workability and a high durability. The mix design is similar to a SCC but without coarse aggregates. One disadvantage of UHCP is the high mixing time for a good homogenisation. An optimal mixing time was defined as the time when the mix has the best flowability, measured by the slump flow and the funnel flow time. This time was called stabilisation time and was determined when the required mixing power keeps constant. After this optimum, a flowability loss is seen, caused by an increase of the specific surface by 8%. This time depends on the factor  $\phi/\phi_{max}$  where  $\phi$  is the particle volume and  $\phi_{max}$  the maximum particle concentration or the minimum theoretical particle volume (calculated following Schwanda). This time may be reduced significantly by a higher mixer speed, but at high speed there is more air entrained. A speed profile – low high low – reduces the mixing time without a negative influence in the properties of the hardened concrete.



A topic dealing not with cementitious based materials was contributed by Wiebke Markgraf (Univ. Kiel, Germany). She presented Rheological Research on the Soil Micro Mechanics with an example from South Brasilia Soil as a three phase system, which is a visco elastic material with a micro structural stability. This properties are measured by plate rheometer, running amplitude sweep tests under oscillatory conditions. The specimen are natural soils. The shear behavior is influenced by texture (clay content, clay mineralogy, Fe[hydr]oxides). Physicochemical properties and water content affect micro structural changes, (micro)aggregation, and microstructural stability. By interpreting the curve characteristics of  $G'$  and  $G''$ , the following can be quantified: dissipating elasticity (= decrease of  $G''$ ) and frictional heat (= slight increase of  $G''$ ) before transition to creeping, which is related to an increase in contact points and structural breakdown).

After the colloquium at March, 12th, like every year things are furthermore discussed in the evening, at a typical restaurant located in the historical city of Regensburg. On March, 13th at a laboratory workshop measurements on real mortars and fresh concrete were done with the Viskomat and BT2 rheometer. The 18th Regensburg colloquium and workshop will take place mid of March 2009 at the Univ. of Applied Science, Regensburg, Germany. Most of the papers are completely presented at <http://www.schleibinger.com>

M. Greim  
Schleibinger Geräte GmbH  
Gewerbestraße 4  
84428 Buchbach  
Germany  
[greim@schleibinger.com](mailto:greim@schleibinger.com)

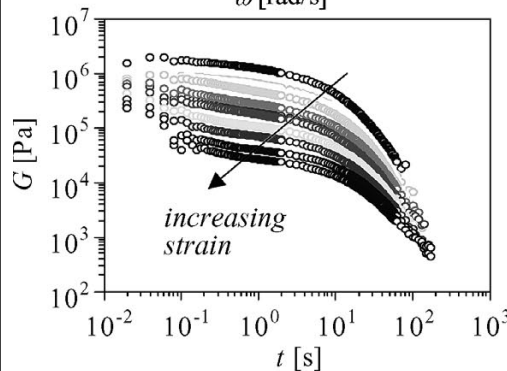
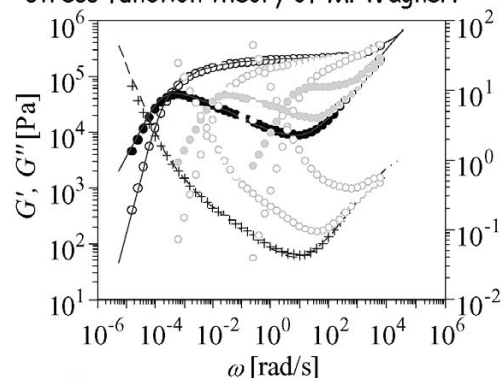
Prof. Dr. W. Kusterle  
Hochschule Regensburg  
Fakultät Bauingenieurwesen  
Prüfening Str. 58  
93049 Regensburg  
Germany  
[wolfgang.kusterle@bau.fh-regensburg.de](mailto:wolfgang.kusterle@bau.fh-regensburg.de)



*IRIS* drives innovation in rheology: interactive graphics for data analysis, seamless communication of data, comparison with models and more. Import data from any source, shift, calculate spectra, compare, store, retrieve, and plot within minutes.

*IRIS* allows the rheologist to pursue his/her real mission: explore new materials, discover relaxation patterns, apply to processes, be quantitative and reliable, communicate results, explain and teach.

*IRIS* (new) predicts from molecular theory: (a) tube dilation theory of T. McLeish and coworkers and (b) molecular stress function theory of M. Wagner.



E-mail: [IRISrheo@yahoo.com](mailto:IRISrheo@yahoo.com)  
<http://rheology.tripod.com/>